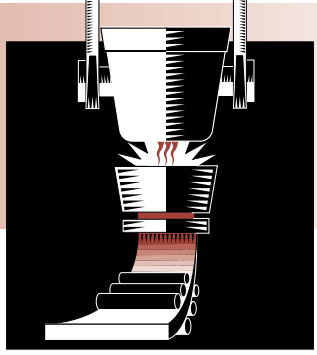
# STEEL

**Project Fact Sheet**



## Improving the Efficiency of Electric Arc Furnaces (EAF) in the United States

### Benefits

- Energy savings of 75 kWh per ton of steel produced
- Reduced $NO_x$ emissions
- Increased EAF productivity
- Minimization of grid flicker

### Applications

Successful completion of the Steelmaker Pilot will provide a database of technologies and information on modern equipment that will improve EAF productivity and substantially decrease energy consumption in the U.S. steel industry.

## The development of an intelligent steelmaker process control may increase productivity in EAFs by over 20 percent and reduce energy consumption

The last two decades has seen tremendous growth in the use of EAFs for steelmaking. Only EAF facilities were built during this period. Currently, this technology produces approximately half the domestic steel. However, the full benefits of EAFs have not been realized. This project entails developing a Steelmaker Pilot. It will have an intelligent process control system which integrates advanced, knowledge-based computing techniques to monitor, optimize, sequence and control the steelmaking process and equipment. It should allow EAFs to increase their capacity by over 20 percent. It should also result in overall energy savings approaching 75 kWh per liquid steel ton.

The research will result in environmental benefits for the EAF community. The Steelmaker Pilot will define optimum conditions for operating under a continuous foaming slag. These conditions decrease the amount of $NO_x$ formed per ton of steel melted. Prior research has also shown that a foamy slag will reduce dust generation by over 90 percent.

EAF steelmaking can cause fluctuations in electric utility grids, a phenomenon known as flicker. It adversely affects other customers on the grid. This research will quantify the impact of foamy slag on flicker and apply artificial intelligence technology to reduce it.

### Diagram of Steelmaker Pilot

**Steelmaker Pilot**

| Steel Maker Pilot | By Whom |
|---|---|
| Charge Design with Slag | Albany Research Center & DL Schroeder & Associates |
| Charge Design with Energy | DL Schroeder & Associates |
| Q-VAR | DL Schroeder & Associates |
| Foamy Slag | University of Alabama |
| Postcombustion | Air Liquide America Corporation |
| End-Point | UHP International & DL Schroeder & Associates |

**Steelmaker Pilot diagram listing tasks and project partners.**

## Improving the Efficiency of Electric Arc Furnaces (EAF) in the United States (Continued)

The research covers “Apply and Evaluate Artificial Intelligence Techniques for EAFs” and “Improve Flicker Control” of the Steel Industry Technology Roadmap. Therefore, this research project investigates the integration of modern equipment, advanced process and informational intelligence technologies, and innovative training programs to improve U.S. electric furnace steelmaking. This research is conducted in a controlled production environment to enable the identification of the optimum electric furnace steelmaking system. The following benefits will be a direct result of this research project:

- Provide procedures for m ore efficient operation of EAFs.
- Improve the quality of the environment by reducing noise pollution, carbon dioxide generation, $NO_x$ generation, dust, and flicker.
- Improve the competitive status of EAFs in the world market by reducing the operating cost of EAF steelmaking in the U.S.

## Project Description

Goal: To develop a Steelmaker Pilot and verify its operation in modern, well-run, AC and DC furnace meltshops. Using the Steelmaker Pilot, targets, economic, energy, environmental objectives will be verified and obtained under U.S. steel plant conditions.

To develop a Steelmaker Pilot resulting in an intelligent process control system that integrates advanced, knowledge-based computing techniques with the more traditional algebraic approaches for monitoring, optimizing, sequencing, and controlling the steelmaking process and equipment. In order to achieve this it is necessary to research methods of improving energy efficiency and reducing operating costs of the electric arc furnaces in the U.S. and to validate the practices in an operating environment.

Operational objectives of the project are:
- Perform the data collection, analysis and experimentation necessary to develop steelmaking and operating practices capable of being tailored that optimally exploit the mix of available equipment and energy sources.
- Embed these steelmaking, operating, and maintenance practices in a reusable, executable knowledge base that is computer-based.
- Validate and fine tune the knowledge base through meltshop trials.

Over 20 steel companies, members of the Steel Manufacturers Association, and, in addition, established steel industry suppliers have committed to tasks outlined under Progress and Milestones. These are tests run on full-scale production facilities that will improve operating performance of the electric furnace and fine tune the Steelmaker Pilot.

The first AC demonstration site is Tamco Steel, California; it is the last steelmaking plant in California.

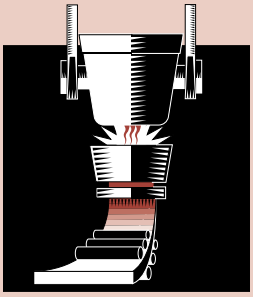
## Progress and Milestones

The Steelmaker Pilot is a three-year project.

| | | |
|---|---|---|
| • AC Demonstration Site: | Start Date: | 2001 |
| | Completion Date: | 2003 |
| • DC Demonstration Site: | Start Date: | 2003 |
| | Completion Date: | 2004 |

## Commercialization Plans

A corporation will be formed (EAF Consortium) with the participants being given ownership equal to their funding. At project completion, the corporation will commercialize, license and/or sell the intelligent property of the corporation.



### Project Partners

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The Carbide/Graphite Group, Inc.
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